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Sent via email: ecosystemamendment@deltacouncil.ca.gov

Randy Fiorini, Chair

Susan Tatayon, Vice Chair

Frank Damrell, Jr., Member

Mike Gatto, Member

Maria Mehranian, Member

Skip Thomson, Member

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Subject: Comments on Delta Stewardship Council’s Three “Synthesis Papers”

Dear Chair Fiorini, Vice-Chair Tatayon, and Council Members:

Restore the Delta advocates for local Delta stakeholders to ensure that they have a direct impact on water management decisions affecting the water quality and well-being of their communities, and water sustainability policies for all Californians. We work through public education and outreach so that all Californians recognize the Sacramento-San Joaquin Delta as part of California’s natural heritage, deserving of restoration. We fight for a Delta whose waters are fishable, swimmable, drinkable, and farmable, supporting the health of the San Francisco Bay-Delta Estuary, and the ocean beyond. Our coalition envisions the Sacramento-San Joaquin Delta as a place where a vibrant local economy, tourism, recreation, farming, wildlife, and fisheries thrive as a result of resident efforts to protect our waterway commons.

We write to comment on the three “synthesis papers” released to the public in early April (though they were dated March 23, 2018). These papers address ecosystem stressors, climate change, and habitat restoration. They appear to be intended by the Council as representing a combination of a survey of the “best available science”; an existing conditions or baseline report on Delta adaptation to stressors, climate change, and habitat restoration; and a modest attempt to point out directions the Council is thinking of going as it prepares to amend Chapter 4 of the 2013 Delta Plan.

We find the synthesis papers less than synthetic. We have several types of comments: specific editing and drafting matters (including reports' style choices and organization); policy-related comments; and comments on whether your staff have actually incorporated and relied upon the best available science in preparing these papers for public review.

As an additional overarching comment on these papers, it is not made clear to readers whether, where, or how the narratives of these papers would be integrated into, or used to amend Chapter 4 of the Delta Plan. In reviewing Chapter 4 of the 2013 Delta Plan, we observed that only very brief sections are currently included in Chapter 4 for Ecosystem Stressors (p. 124), Climate Change (p. 126), and Ecosystem Restoration (p. 126-147). There are numerous existing Chapter 4 sidebars, charts, tables, and other information whose disposition with the amendment process are unclear from the content of the synthesis papers.

Will there be deletions of any or all of these features of Chapter 4 that are not included in one of the synthesis papers? One passage in particular must not be deleted: "Water flow is a 'master variable,' driving the ecological health of rivers and their ability to support valued environmental services (Poff et al. 1997, Postel and Richter 2003)." (Chapter 4, p. 128, left column.) This passage is foundational to the Delta Plan's utility and substance in reducing stressors, responding to climate change while advancing the coequal goals, and addressing habitat restoration problems. It should be allowed to survive the amendment process. At present we find no comparable statement in any of the three "synthesis papers." We would appreciate DSC staff and council members making clear how these narratives are to be employed in Chapter 4, and whether existing passages of this Chapter 4 are expected to continue within the Delta Plan.

Thank you for the opportunity to comment on these synthesis papers. We look forward to reviewing the next draft and trust that you will not rush forward with amendments in the immediate future until more public review and input is provided to you. We look forward to participating in this process.



Barbara Barrigan-Parrilla
Executive Director



Tim Stroshane
Policy Analyst

Attachments:

1. Specific Editing and Drafting Matters
2. Policy-Related Comments
3. Science-Related Comments

cc: Jennifer Pearson, Executive Director, Delta Stewardship Council
Michael Tubbs, Mayor, City of Stockton
Robert Granberg, City of Stockton Municipal Utilities Department
Delta Counties Coalition
Bob Wright, Friends of the River
Bill Jennings, California Sportfishing Protection Alliance
Tom Zuckerman, Central Delta Water Agency
Felicia Marcus, Chair, State Water Resources Control Board
Tam Doduc, Member, State Water Resources Control Board
Dorene D'Adamo, Member, State Water Resources Control Board
E. Joaquin Esquivel, Member, State Water Resources Control Board
Steven Moore, Member, State Water Resources Control Board
Nina Robertson, Earthjustice
Michelle Ghafar, Earthjustice
Osha Meserve, Soluri Meserve
Doug Obegi, Natural Resources Defense Council
Jon Rosenfield, The Bay Institute
Barbara Vlamis, AquAlliance
Kathryn Phillips, Sierra Club
Kyle Jones, Sierra Club
Jeff Miller, Center for Biological Diversity
Adam Keats, Center for Food Safety
Michael Brodsky, Save the California Delta Alliance
Carolee Krieger, California Water Impact Network
Colin Bailey, Environmental Justice Coalition for Water
Yana Garcia, California Environmental Protection Agency
Kate Poole, Natural Resources Defense Council
Darcie Luce, Friends of the San Francisco Estuary
Laurel Firestone, Community Water Center
Jennifer Clary, Clean Water Action
Andria Ventura, Clean Water Action

Attachment 1
Specific Editing and Drafting Matters
(including style choices, clarity, and organization)

Ecosystem Stressors Paper

p. 1:11-29¹—In this passage, the DSC attempts to deftly rename and revise the history of the Bay Delta Conservation Plan (BDCP), its Conservation Measure 1 tunnels project, the subsequent dropping of the habitat conservation plan approach for California WaterFix, and introduces the tunnels project as mere “facility upgrades” to the State Water Project and Central Valley Project. While technically correct on the legal bases for conservation planning in the Delta (in the state Fish and Game Code as well as the federal Endangered Species Act), the passage completely obfuscates the events that have occurred with BDCP and now California WaterFix since July 2012 when the tunneling approach was first introduced. Why is the DSC timid on naming what everyone else in the water orbit of California is so well aware of?

p. 7, Figure 2—The figure lacks a source. Also, does it replace Figure 4-1 of Chapter 4 (p. 122) or is it intended to supplement narrative somewhere else?

p. 13:Figure 6—This chart is titled “land use trends in the Delta and Suisun Marsh from 1990 to 2014.” It appears to show only a very slight decrease in agricultural land use in the Delta and Suisun Marsh during this period. The decrease is so slight as to be nearly imperceptible for all the portrayed land uses. While the narrative on page 12:10-11 indicates that “natural lands” have increased 21.4 percent in the Delta and Suisun Marsh since 1990 (and cites Figure 6), the chart fails to illuminate this otherwise substantial change. We recommend you convert this chart to a data table with calculated percent changes to corroborate the narrative on page 12. Also what does “natural” mean here?

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p. 14:3—“but “though~~t~~ to be the most species-rich...” please fix this typographical error.

p. 14:28-30—change “shifts in species composition that *is effecting* the broader...” to “shifts in species composition that **are affecting** the broader...”

p. 15:Figure 7 and p. 16:Figure 8—Council staff has included two conceptual models that illustrate primary production and the regulating factors in primary productivity, respectively. These are the only two conceptual models reproduced or apparently referred to in the Ecosystem Stressors paper, yet there are numerous other conceptual models that address many key ecosystem and stressor problems in the Delta region, not the least of which address food webs, salmonids, longfin smelt, Delta smelt, selenium, methyl mercury, and one specific to a single nonnative invasive clam,

¹ Our narrative reference convention is [page number]:[line range] for text passages on which we comment. For tables and figures our convention will be [page number]:[table or figure number].

Potamocorbula amurensis. Each of these, and more conceptual models, are available through the Delta Regional Ecosystem Restoration Implementation Program (DRERIP) web site maintained by the California Department of Fish and Wildlife.²

p. 17, Figure 9—This chart is titled “historical and modern relative contribution of primary producer groups.” We find this chart confusing, the further we reflect on it. It appears to provide only speculation about the relative productivity of phytoplankton, micro algae, aquatic vegetation, marsh vascular plants, and riparian vegetation. We understand that it is an attempt to illustrate the idea that the Delta ecosystem has changed dramatically over time, and that the flow of energy through its ecological structure has diminished. But the caption at right indicates that the size of each box is “proportional to the amount of *hypothesized productivity*.” Yet the vertical axis label states that the annual magnitude of production implied by the chart is only “(conceptual).” Because of the qualifier “hypothesized productivity” and the “conceptual” magnitude of production, we as readers cannot be certain that the difference in physical size is actually proportional or merely impressionistic. In short, we find that this chart fails to persuade us as lay readers, and if it fails to persuade lay readers on a matter of scientific importance, we recommend you either look for another source that provides a chart to illustrate a similar point, provide the factual foundation to sustain this chart, or drop the chart from use in the Chapter 4 amendment process.

p. 30:21-22—Council staff state “The Delta Plan includes 14 regulatory policies, a suite of recommendations, and performance measures.” This sentence bothered us, because the synthesis papers appear to be concerned primarily, or even strictly, with amending Chapter 4 of the Delta Plan. Currently, we count just five regulatory policies in Chapter 4. So it is unclear why the Ecosystem Stressor paper mentions the 14 regulatory policies here. If Council staff is intent on an exact number of Chapter 4 regulatory policies, we suggest you simply state “five regulatory policies in Chapter 4.” In addition, “a suite of recommendations” implies only that there are “a lot” of recommendations, implying that Council staff may have been lazy about simply counting how many recommendations there are currently in Chapter 4 (there are, by our count, nine recommendations, ending with ER R9).

p. 30:33—Section 8 referred to here should instead be Section 7.

p. 31:1-2—Consideration 1 here begins with “The findings of this synthesis paper do not foundationally change the core strategies of Chapter 4 of the Delta Plan. In combination with the findings of the Climate Change and Restoration Papers...” You have nowhere labeled any of the concluding concepts in these three papers “findings” except here in the Ecosystem Stressors paper. It appears you refer to the “implications” of the previous Section 7. You should simply change the word “findings” to “implications” since you are drawing implications from syntheses presented—many of which are based on conceptual models or hypothesized relationships (see Figure 9 above)—not findings

² http://www.dfg.ca.gov/erp/conceptual_models.asp; accessed April 16, 2018.

which are matters of reproducible and observable fact. If Council staff persist in using the word findings here, they would be overstating the factual basis of the synthesis papers, which would not be particularly scientific of Council staff.

Climate Change Paper

p. 3:9-18—Council staff report on three “representative concentration pathways” (or RCPs) for describing and projecting greenhouse gas (GHG) emissions into the future, apparently obtained from the 2014 Intergovernmental Panel on Climate Change (IPCC). Each of the bulleted RCP descriptions contain radiative forcing average measurements (expressed in Watts per square meter) anticipated by the year 2100. We think the implications of these various RCP scenarios would be given context and meaning if you also provide a baseline estimate of present levels of trapped solar radiation against which your readers may compare the implications of these scenario estimates of future radiative forcing.

p. 4:Table 1 (Frequency of Extreme Events)—It is stated next to “Delta flows” that “[i]ncreased frequency of floods (including atmospheric rivers) and droughts.” This sentence construction sounds as though atmospheric rivers cause floods every time an atmospheric river occurs; that is not really the case, since atmospheric rivers are a meteorological formation, and not a specific hydrologic result. It would be better to clarify at the outset that an increase in the frequency of atmospheric rivers with climate change is expected, and that atmospheric rivers are important meteorological contributors to flooding (especially since there are many other causes of flooding that relate more to inappropriate or inopportune siting of urban or other development, poor maintenance of levees, reservoir operational and/or maintenance problems, lack of floodplain and drainage control to reduce flooding, etc.).

p. 8:Figure 4—This page presents a tile-work of emission scenario charts derived from two of the three RCP scenarios focused on Eight River Index Flows. These charts at a minimum are far too small to read easily. They should be separated onto at least two to four pages so that the charts can be presented legibly, and provided with captions to explain their significance independent of the narrative. Their legends are far too tiny for most adults to read unaided (beyond prescription glasses). A caption for the charts is also needed to assist readers in understanding (since it is not explained in the narrative on adjacent page 7) that the Eight River Index of flows is a) composed of the Sacramento River and its major tributaries (the American, Feather and Yuba rivers), and the San Joaquin River and its major tributaries (the Stanislaus, Tuolumne, and Merced rivers), and b) that the index is used to help forecast runoff, storage, and ultimately allocations and deliveries by the State Water Project and the Central Valley Project north and south of the Delta. These charts are presented as though anyone reading them—which is not most people—would know exactly to what use this index is put, and what the charts mean for water supply and environmental flows. This is not the case.

p. 10:Figure 5—This chart is titled “changes in flood magnitudes with different return periods under the median climate scenario.” The narrative on the previous page (9:43-45) indicates that Council staff are analyzing the likelihood that future storms will generate more rain than snow compared to present climate conditions and thus “greater increases in runoff and flood volumes.” We find several problems with Figure 5. First, it includes the Kings River at Pine Flat Dam, which is outside the San Joaquin River Basin. It is in the Tulare Lake Basin, and does not usually flow to the Delta, even under many high runoff conditions. Second, the chart should disclose that the flood magnitude percentage increases reported for Cosumnes, Mokelumne, and Calaveras rivers are tributaries east of the Delta and have headwaters that mostly do not reach typically into snowpack regions; two drain primarily from the Sierra foothills, while the Mokelumne watershed does go higher into elevations where snowpack occurs. Third, the other four river systems reported in the chart are geographically south of the Delta, and their watersheds reach high into Sierra snowpacks. To really make the point of the narrative, this chart should include only the Mokelumne, Stanislaus, Tuolumne, Merced, and San Joaquin River information. The others are either outside usual Sierra snowpack (Cosumnes and Calaveras rivers) or are outside the San Joaquin River Basin (Kings River).

p. 10:20-21 — Change “increase drought conditions” to “increase~~d~~ drought conditions” so that it is parallel with “Reduced snowpack...”

p. 11:39-41 — There is an incomplete sentence here, and the citation (OPR 2017) is not found in the attached references of the Climate Change paper. Could it be OPC 2017, or is it CNRA/OPC 2018?

p. 12:Table 2—Table of Projected Sea Level Rise (SLR, in feet) for San Francisco. There should be some labeling or captioning done to clarify that the 4.6 feet of SLR anticipated to occur by 2065 (stated in page 11:36-39) is actually interpolated from the H++ column of Table 2 as a midpoint between 3.9 feet of SLR in 2060 under a high emissions scenario and 5.2 feet of SLR in 2070. This would facilitate the ability of readers to follow the basis for the narrative analysis of risk aversion that follows.

p. 14:Figure 7—Inundation in the Delta and Suisun Marsh for 4.6 feet of SLR and a 100-year storm event. We found this map to be hard to interpret given the minimal gradations between shades of blue to near-purple used to provide visual contour intervals of inundation from a 100-year storm event. Fortunately, while the caption clarifies that apparently the only place the 91 to 96 feet of inundation contour interval is found is Carquinez Strait well west of Pittsburg “and are not from levee overtopping...,” it also states that current leveed areas (and assuming no levee improvements) would be inundated to a maximum of 21 to 30 feet. This renders six contour intervals in the legend of this map all but useless, unused, and therefore meaningless, if we are reading this map and its caption correctly. We also contend that the assumption of no levee improvements is uncalled for, unless the DSC is expecting that Metropolitan Water District, which owns islands along the alignment of the Delta Tunnels project and Middle

River intend to let their islands' levees deteriorate deliberately (and since most in-Delta island owners contribute to levee maintenance). Since California WaterFix could not be built for at least 15 years, this seems a dangerous assumption that would jeopardize water quality to state and federal exports in the south Delta in the interim.

p. 27:8 and p. 27:12—Two citations given in the text are not included in the Climate Change Paper's references at the end. These are "Miller et al 2008" and "Bates and Lund 2013." Please update the references accordingly so your readers can find and evaluate these two sources.

p. 36:9—"Climate change effects the five core strategies..." Actually, the DSC effects the five core strategies because it is authorized to under the Delta Reform Act of 2009; but climate change affects the five core strategies. We recommend you use "affects" in this sentence to be grammatically correct.

p. 44:Figure 11—Inundation Risk to Human Populations chart has a legend in the upper right-hand corner containing two lists, one for Delta legacy communities at risk and another for Delta cities at risk. Except in the right light, or with a magnifying glass, these lists are illegible because they are coded in white ink rather than dark or black ink. Please make these legible. Also—the list of Delta cities at risk omits Stockton. Please add Stockton to the list of Delta cities at risk as the winter high flows of 2016-2017 demonstrated along the San Joaquin River near downtown.

Protection, Restoration, and Enhancement of the Delta Ecosystem Paper

p. 14:15-42—This passage fails to adequately define reconciliation ecology. The paragraph states that Rosenzweig "introduced the concept of reconciliation ecology and described an approach to introduce novel analog ecosystems through the modification of built or significantly altered landscapes...to support biodiversity." We wonder if the key to defining "reconciliation ecology" lies with the phrase "novel analog ecosystems" or with "built or significantly altered landscapes..." but that leaves we readers guessing at the meaning of the phrase "reconciliation ecology." The rest of this passage does little if anything to illuminate this definition, even indicating at one point that "[r]econciled landscapes, by design, will not target a full suite of geomorphic or ecological processes..." Please provide a brief definition of reconciliation ecology from Rosenzweig or another proponent of the practice. It should also be coupled with a brief statement of reconciliation ecology principles (which are mentioned at 14:27-28), and description of what is meant by a "novel analogue ecosystem."

p. 25:6-8—Once again, Council staff slip into unnecessary euphemisms to avoid discussing publicly known programs or activities. "With the State's shift to **more focused conservation actions**, the Delta currently lacks overarching science-based ecosystem preservation and restoration objectives to guide management of the Delta ecosystem." Council staff need not be afraid to refer outright to any number of existing

state, federal, or other restoration and conservation programs and activities, such as EcoRestore or other programs. (It is unclear to us whether any of these programs really represent "focused conservation actions" given the paucity of funds they have available compared with funding to keep the awful California WaterFix project afloat.) At its best, referring to "more focused conservation actions" could mean anything and does not help the public understand to what Council staff refer to here. We also thought the point of having a Delta Stewardship Council was to have the Council set objectives for restoration and preservation in the Delta based on objectives and goals stated in the Delta Reform Act of 2009. The Restoration Paper subsequently mentions (25:27-44 and 26:1-13) the Delta Conservation Framework, but further indicates that its purpose is less to set objectives than to identify "conservation opportunity regions" within which landscape-level restoration planning could occur. This sounds like something that DSC should invite in to discuss DRA objectives and articulate how those objectives could be placed into Chapter 4 of the Delta Plan and implemented in CORs around the Delta. A good first step might be to incorporate a list of Delta Reform Act ecosystem restoration policies and objectives to go with a map from the DCF of CORs into the next draft of the Restoration synthesis paper.

p. 39:32-39— This consideration item identifies "creation of analogue ecosystems, or opportunities to support biodiversity on working lands" again as something to work toward in Delta restoration. While reconciliation ecology is not mentioned here, resurfacing "analogue ecosystem" terminology points up the absence of the earlier lack of definition of both reconciliation ecology and "novel analogue ecosystem" that Council staff seems to think is important. But your reading public needs more explanation as to what these concepts are and the practices and strategies they represent for improving ecological conditions in the Delta, before the public can meaningfully support them.

p. 40:4-5— In line 5, add "to" in the passage "Recovery and conservation planning efforts have established specific objectives and decades of restoration planning TO support the development of science based, measurable, and time-bound objectives."

Attachment 2

General Policy-Related Comments

The DSC fails to integrate California's water policy framework within the synthesis papers and Chapter 4's approach to implementing the 2009 Delta Reform Act (Act). This framework is stated in the Act itself (e.g., Water Code sections 85023 and 85031) and encompasses the reasonable use doctrine (California Constitution, Article X, Section 2; California Water Code section 100), the public trust doctrine (as mandated state case law); area of origins law (especially the Delta Protection Act of 1959, Water Code sections 12200-12205), the policy to reduce Delta reliance for California's future water supply needs (Water Code section 85021); and the coequal goals of balancing ecosystem protection and restoration with increased water supply reliability (Water Code section 85054).

The DSC privileges the coequal goals as the focus of all of its planning and regulatory efforts in flagrant disregard for the need to balance all of these elements of California water policy. In particular, the requirement to reduce Delta reliance for the state's future water supply needs is not simply a water supply policy; it is also a source of flow as a "master variable"³ for ecosystem restoration, stressor reduction, and climate change adaptation—in short, a policy and practical opportunity being missed by the DSC in its futile and short-sighted quest to "balance" the overly narrow statement of coequal goals.

The Delta Protection Act of 1959 requires that the Delta's needs continue to be met even as exports occur (Water Code section 122XX), and is bolstered by the mandate to reduce Delta reliance on exports to meet California's future water needs (Water Code section 85021).

Connected to the narrow emphasis on implementing coequal goals, the DSC over-emphasizes the Act's requirement to rely on "best available science." Our comments to follow indicate the degree to which best available science is circumscribed by DSC preference for limiting investment in Delta levee maintenance and island protection as the backbone for the Delta's economy. In short, the DSC uses a pretense of applying best available science in these synthesis papers, but—just as one example—nowhere is there consideration of the Delta economic sustainability plan (DESP) prepared by Dr. Jeffrey Michael, environmental and business economist with the University of the Pacific in Stockton for the Delta Protection Commission. The DESP carefully and systematically evaluated the levels of investment need for long-term levee protection, and their relationship to the sustainability of Delta agriculture, tourism, and recreation. Instead, DSC narrowly construes "best available science" as physical and natural science, to the exclusion of insights and findings derived from social sciences, indigenous Indian land and water management practices, and other elements of human practical experience that Delta residents and businesses have accumulated and relied on for decades to

³ Delta Plan, Chapter 4, p. 128.

sustain dozens of islands, use water, and provide livelihoods to the regional economy of the Delta.

Finally, DSC provides an expanded discussion of adaptive management in connection with the use of best available science, and even offers "principles" that could be applied to integrating adaptive management to the ongoing review and evaluation of DSC policies (few as they are) of the Delta Plan's Chapter 4. "Adaptive management" is presently being employed in vague and narrow terms by proponents of the California WaterFix project, focusing its scope on the research needs associated with somehow managing and maintaining the sparse populations of listed fish species that use the Delta (either as resident fish or those migrating through in the course of their life histories). If DSC is truly serious about adaptive management, it will need to devote considerable fiscal resources to the conduct of ongoing research, monitoring, reporting, and honest evaluation of all relevant conditions in the Delta—the ecosystems, food webs, stressors (including nonnative invasive species, potential contaminants, and other stressors), water quality, groundwater conditions, and economic and social life in Delta legacy and environmental justice communities. The scope of adaptive management by DSC needs to align with the broad array of policy concerns required by the Act of the Delta Plan as well as other policy concerns (such as environmental justice and anti-discrimination policies) of the state of California.

Attachment 3

Comments on Scientific Topics in the Synthesis Papers

Ecosystem Stressors Paper

General Comments

Contaminant stressors are downplayed to a fault in this synthesis paper. There are just two references to mercury, only one each to selenium and pesticides, and no references either to arsenic or boron, nor to numerous other metalloid and metallic contaminants (some of which derive from sources upstream of the Delta). All contaminant references are pretty much confined to one paragraph on page 21 of this paper.

DSC staff should address contaminants head-on in this paper and in its amendments to Delta Plan Chapter 4 wherever there are clear overlaps with potential restoration and climate change issues. This effort should begin with the baseline scientific issues described in the CalFED Science Program's *State of Bay-Delta Science* report's chapter on water quality (2008, 55-72), which includes salinity, suspended sediment, selenium, pesticides, mercury, and legacy and emerging water quality issues. And the Delta Independent Science Board is working on a water quality science review with specific attention on contaminants—and which contains a bibliography of references. Additional scientific buttressing for the Ecosystem Stressors paper is available from several DRERIP conceptual models, each of which contain abundant references to supporting scientific findings.⁴ There are DRERIP models that address mercury, selenium, pesticides and other related topics. Their absence from the DSC's "synthesis papers" indicates gaps in the agency's reliance on best available science in the development of amendments for Delta Plan Chapter 4 to this point.

As we identified earlier, the existing Delta Plan, Chapter 4, identifies water flow as a master variable in scientific conceptualization of water quality and ecosystem mechanisms through our Bay-Delta estuary. Chapter 4 should address itself far more than it does to the pathways by which flow can be an important factor in alleviation of a variety stressors to Delta ecosystems, be they invasive nonnative species like the overbite clam *Potamocorbula amurensis* (whose benthic [channel-bottom] range is repelled by fresh water flows, but expands in low flow environments) or contaminant stressors like selenium (which is readily bioaccumulated by the overbite clam in low flow periods). (Restore the Delta's California WaterFix hearing testimony (Part 2) addresses in part the interaction of these stressors.⁵) This synthesis paper needs to address such

⁴ http://www.dfg.ca.gov/erp/current_models.asp, accessed April 18, 2018.

⁵ See Tim Stroshane's testimony for Restore the Delta, RTD-12, accessible at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/part2/RTD_12.pdf, pages 13-25. Exhibits related to his testimony are also found under Part 2 of Restore the Delta's case in chief at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/restore_the_delta.html, accessible April 18, 2018.

interactions of different stressors and the role flow can play in alleviating the threat to Delta food webs, ecosystems, and potentially public health (as can be the case with harmful algal blooms).

Specific Comments

p. 6:6-7—Figure 2 on the next page (Delta and Watershed Planning Area) has no cited source. We also have no indication from the narrative or the map itself whether it is intended to replace or supplement any existing graphics from Delta Plan, Chapter 4.

p. 8:Figure 3—This illustration is titled "Changes in flooding patterns in the Historical and Modern Delta." Does it replace current Figure 4-1 or supplement it in the Delta Plan, Chapter 4, page 122? We think it should supplement Figure 4-1 because it clearly shows the historical change in water ways from the early nineteenth century to the late twentieth in a way that Figure 3 fails to do—not least because the quality of the graphic displayed in this paper as Figure 3 has poor resolution graphically. We also inspected the original graphic in the source (SFEI-ASC 2014—pages 40-41) and discovered that the DSC has excerpted these maps without providing adequate context for their original publication by the San Francisco Estuary Institute-Aquatic Science Center (SFEI-ASC). While their map graphics address the dramatic loss of seasonally flooded habitats, these maps are clearly linked by SFEI-ASC to the broader adaptation of native fish species to the historical complex and variable landscape that existed in the Delta. Instead of two maps representing "historical" or "modern" floodscapes in the Delta, **there were four, one for each season of the year (fall through summer)**. Moreover, there were time lines across the bottom of these two sets of maps that indicate the seasonal timing of various runs of Chinook salmon. The historical and modern Fall maps appear to be misaligned/matched with the historical Spring and modern Winter maps from the SFEI-ASC original source. DSC's excerpting failed utterly to capture the seasonal differences of flooding in the Delta historically, rather than a misleading pair of unlabeled and uncaptioned maps representing historical and modern conditions. Instead, at p. 7:24-25, DSC staff write that the Figure 3 maps are intended to illustrate disconnection of flood plain and marsh plain in the modern condition. Suffice to say, a great deal of information for the stressor paper was lost with this editorial decision, particularly regarding the potential benefits to anadromous salmonid species. We urge you to restore the full context of these images.

This graphic editing choice implies strongly that the ecosystem stressors paper is intended as a brief against levees protecting islands that simultaneously sever floodplain from marsh plain possibilities. DSC staff may or may not be aware of this emphasis in the Ecosystem Stressors paper, but it was plain to us at Restore the Delta. The difference in emphasis between this paper and the Restoration paper was stark. The latter synthesis paper at least begins introducing as potential solutions the strategy of reconstructing levees with significant setbacks that can create marshy corridors and vegetated refuges that can attract and sustain species (such as giant garter snake or red-legged frog) that find Delta habitat values otherwise lacking at present. Setback

levees can increase channel width while strengthening levee girth and raising levee heights to increase overall channel capacity to help process flood flows while at the same time increasing habitat value. The absence of solutions discussed in the Stressors paper, which we read first, suggested hostility to Delta levees generally as part of the DSC's approach to overall restoration, but when read as a whole, the three papers indicate there remains a place for the levees. This is one example of what we mean when we wrote in the cover letter that these synthesis papers were less than synthetic.

p. 9:Figure 4—This graphic is titled "Primary landscapes in the historical Delta." It would be helpful to the reader to know that this also has the same graphical elements as Delta Plan, Chapter 4, Figure 4-2 on p. 123. We note that this graphic appears to be adapted from a richer (in terms of density of information) depiction (SFEI-ASC 2014, p. 4) that for example quantifies the acreage of each impressionistic "primary landscape": The north Delta had an aggregate of 360,000 acres of "flood basins" accompanied by a pie chart that indicates relative proportions of various habitat types (some wet and some less so) —but are eliminated from Delta Plan Chapter 4 Figure 4-2 and Figure 4 here. However, it is unclear from Figure 4 whether DSC staff intend to keep the clear caption provided for Figure 4-2. We hope so, and we would request that for each conceptual landscape graphical element, the DSC staff place the relative quantities of acreage for the three Delta sub-regions portrayed in this graphic (North Delta, 360,000 acres; Central Delta, 300,000 acres; South Delta, 120,000 acres).

p. 10:13-43 and 11:1-4—While we appreciate that DSC staff have assembled a narrative survey of land cover and vegetation communities in this section, we wonder that this passage leaves unexamined the role that Indian communities and their land management practices may have played in managing tules in marsh plain and wetland communities, riparian forest and scrub, and upland margins—in establishing and managing the very land cover that the narrative implies was "natural." The historical ecological research performed by the crack scientists and historians at the SFEI-ASC is impressive and useful, but the DSC narrative here ignores the possibility that central California Miwok and other indigenous peoples may have played a role in shaping the biogeography and composition of communities, and may have done so to such an extent that over decades and even centuries their agency in ecosystem and land management may have even shaped landscapes and landforms that SFEI-ASC has so carefully mapped (and which DSC staff reproduce in Figure 5). We see that, in Whipple 2012, ethnobotanist and author Kat Anderson was consulted in "personal communications" as was her 2005 book *Tending the Wild: Native American Knowledge and the Management of California Natural Resources*. DSC staff should seek out, review, and consider scholarship and other research into California Indian land and water management practices that relate to marsh, wetland, riparian/woodland, and upland margin habitats to gain additional insights. Until that is done, we are skeptical at this juncture that DSC has synthesized let alone identified all the best available science and practical knowledge that could be brought to bear on ecosystem stressor problems, restoration, and potential strategies for climate change adaptation.

p. 12:Table 1 and lines 4-15—DSC staff converted area data for different types of land cover and land use types originally identified and quantified by SFEI-ASC (2014, 24-25; 2016, 14-15) and converted the data from metric hectares to English unit "acres." Staff went one step further than SFEI-ASC did however. Where SFEI-ASC authors avoided summing the historical and modern hectare data, DSC staff have inappropriately and fallaciously totaled in Table 1 a fictitious category called "total natural land cover acres (does not include agriculture, managed wetlands, urban/barren, water)". They also obtained and added to the acreage for the Delta land cover data for Suisun Marsh, (addition of which is inoffensive here). What is problematic, given our previous comments about the possibility and likelihood of California Indian management activities in pre-European contact Delta and Suisun Marsh landscapes, is the word "natural." The problem with the word "natural" cuts two ways with what DSC staff have done here: On one hand, they appear to have assumed that all of the historical acreage was somehow "natural"—that is, they imply that the various historical land cover types summed in Table 1 are indeed "natural" in the sense that there was no human agency involved in their range, location and extent.⁶

On the other hand, is it true there is nothing natural about "managed wetlands" which are also included in "modern acres" in Table 1? How are we to interpret parks and wildlife refuges today (such as Big Break Regional Park or Stone Lakes National Wildlife Refuge) other than conscious interventions by human beings that seek to provide refuge and habitat for a variety of plant and animal species? Does human intervention make such places less natural for the species that find advantage in them? And for that matter, is there nothing natural involved in agriculture where humans cultivate plants, intervene into predator-prey relationships, and engage in forms of crop selection that have effects not unlike natural selection in other ecosystems where human intervention might be less clear? Urban lands are increasingly infiltrated by native wildlife such as raccoon, coyote, crow, raven, opossum, skunk, and numerous birds reliant on plants and gardens cultivated by human beings. Are not these natural relationships? Is DSC staff erroneously assuming that humans are not part of nature? Similar arguments can be mustered for specific ruderal, non-native, and "barren" lands where what is natural may be harder to distinguish from "artificial" than may first appear.

Suffice to say, Table 1 can stay, in our opinion, but its sum-totaling of "natural land cover acres" should be deleted as fallacious and erroneous, without coherent logical basis in fact; the concerns we express here may have contributed to why SFEI-ASC authors did not themselves compute such totals in their reports' presentations (2014, 15; 2016, 25).

⁶ It is also unclear from the Ecosystem Stressors Paper Table 1 whether the SFEI-ASC and DSC acreages represent a biogeographic snapshot in time, a long-term average, a particular historical epoch—the latter of which raises questions of whether pre-historic climate change tendencies are somehow factored into these acreages or not. While the table and map comparisons (p. 11:Figure 5) are intriguing, they raise scientific questions that at least from DSC staff go unanswered.

p. 12:6-8—The paper cites California Department of Conservation Farmland Mapping and Monitoring Program data for agricultural land use in the Delta. This figure (555,807 acres) is more than/different from the agriculture/Non-native/Ruderal figure developed for the Delta and Suisun Marsh by SFEI-ASC (508,938 acres). DSC staff should edit this passage to include a brief explanation of why these two figures differ, rather than let them stand to confuse readers about what might be real or not.

p. 12:13-15—What is meant by the phrase “fully functional ecologically” at the end of this sentence? Is this instead a point being made about how some areas of habitat may be too small or patchy to provide adequate habitat for certain species? What is the standard for a “fully functional” ecology of such a spot?

p. 14:22-30—“Alterations to flows” is once again a DSC euphemism for the large scale export pumping that occurs at Banks and Jones pumping plants of the State Water Project and the federal Central Valley Project, and which have occurred together since the 1970s. Please reduce your use of euphemisms such as this one. In the next sentence addressing the large number of species with “heightened conservation status” (another abstract euphemism—does this mean “listed species”? Why not just say so?) the authors employ a citation to ICF Consulting’s Appendix 1A concerning species evaluated for consideration for coverage within BDCP. This document is an “administrative draft” dating to March 2013. How is this best available science in use by DSC staff in constructing this paragraph? Also, please clarify whether BDCP covered species are also each listed species of some type or other. This should be available by consulting the November 2013 draft of the Bay Delta Conservation Plan where there is an appendix volume of species accounts. Finally, the last sentence of this paragraph about species composition shifts affecting the broad ecosystem health is overly abstract and could use an example or two to illustrate what this statement really means.

p. 14:42-44—Here begins a brief discussion of predation hot spots that continues onto the next page. We appreciate that DSC staff brought it up. However, the stressors paper is remiss in not stressing that the majority of predation hot spots occur at certain channel confluences and at artificial structures emplaced in Delta channels (including temporary or permanent operable barriers, bridge trestles, culverts, piers, and other structures help create these ambush locations for predators on vulnerable (often small fish). Little understanding is generated by this brief summary. To stimulate a potentially improved discussion of predation hot spots, we suggest you examine RTD’s part 2 testimony on California WaterFix for a brief survey of recent DWR engineering and BDCP/California WaterFix related analyses of predation hot spots.⁷

p. 24:18-25—The paper states, “Given the limits on hydrologic reconnection, subsidence reversal requires prioritization where the physical landscape supports its implementation...” and goes on to list factors that can and should be taken into account

⁷ RTD-12 (https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/exhibits/docs/RestoretheDelta/part2/RTD_12.pdf) at pages 31-39.

in support of subsidence reversal actions. The paper should rank these criteria and then apply them in map form to develop for the public, other scientists, and landowners where subsidence reversal opportunities may be possible in the Delta. If this approach is so feasible, please map where subsidence reversal might feasibly occur.

p. 28:1-2—We believe we have shown you at least a few instances where it is demonstrable that DSC staff authors of the Ecosystem Stressors Synthesis Paper have failed to apply best available science in the service of development language for amending Delta Plan, Chapter 4—contrary to this sentence. The DSC should avoid such boilerplate assumptions in its future documents; it is a statement that is best reserved for Council resolutions that state findings the Council asserts, rather than have such faulty expressions appear in staff draft documents.

Climate Change Synthesis Paper

General Comments

We found this paper had difficulties in a few areas: levee sustainability, adaptive management, sediment supply issues, and the complex problem of striving to develop restoration sites over a time period when sea level is expected to rise.

We leave to our specific comments below our comments about levee sustainability and adaptive management. In our general comments we will address the relationship of sediment supply to the challenge of Delta restoration amid climate change and sea level rise. In recent decades the Gold Rush legacy sediment pulses finally worked their way through the Delta to the Bay and the Golden Gate. However, sediment supply has decreased substantially because upstream dams built for water supply purposes trap sediment that would otherwise have been transported by upstream river flows toward the mainstem rivers that enter the Delta estuary. The loss of sediment supply is a concern not only in the Delta but in the Bay Area because adequate sediment supply helps sustain and raise subtidal lands where slow moving water deposits fine sediments.⁸ These sediments where available accrete, create new and expanded substrate for new and expanding wetlands and other shore habitats in the Bay, Suisun Marsh, and the Delta. This is especially important because the problem for Delta and Bay restoration projects is that these sedimentation rates are in a race against time with sea level rise. If sea levels (and tidally influenced water elevations in the Delta) rise

⁸ Mr. Stroshane participated in a May 10, 2017, presentation with Brenda Goeden, Sediment Program Manager with Bay Conservation and Development Commission where we discussed, among other topics the problem of sediment supply to the Bay and Delta and strategized about ways to obtain sediment from the upstream reservoirs. Accessible at <http://www.shapingsf.org/public-talks/ecology.html>.

faster than sediment supplies can keep pace, then shore and wetland habitats may be inundated permanently, with attendant losses to biodiversity.⁹

We see little in the Climate Change Synthesis Paper that seeks solutions to the Bay and Delta's sediment deficit problem—or for that matter the problem upstream dam owners face with having their reservoirs increasingly impacted by accumulated sediment behind their dams. What we have, collectively, is a natural resource in the wrong place—a result of upstream dam construction and operation. This, it seems to us, is an adaptive management problem of the highest order because upstream trapped sediments are a resource waiting to be unlocked to address the most pressing problem that climate change poses to ecosystem restoration actions: the need to somehow stabilize the landform elevations that structure the habitats that ecologists and resource managers hope to create in the years and decades to come, in hopes of assisting a wide variety of species with climate change adaptation.

To be sure, this is a different kind of adaptive management problem than the science research that is normally thought of as comprising adaptive management approaches. It will involve identifying ecologically and occupationally safe and efficient methods for extracting upstream sediment from existing reservoirs (which would have the additional benefit of restoring reservoir capacity, at least for a time). It will also involve determining the best methods for transporting and sorting extracted sediments for different economic and ecological uses. The economics of extraction, transport, sorting, and delivery will be essential to the long-term problem of helping ecosystem restoration projects keep pace with sea level rise in the Bay-Delta estuary—and is a suitable subject for the scope of adaptive management under the Delta Plan.

We also wonder aloud whether sediment transport can be integrated as well into the effort to slow or reverse subsidence on the most vulnerable Delta islands identified in the synthesis papers. We did not detect mention of such an approach, but in our opinion it deserves DSC staff consideration here.

See our specific comments on Figure 8 below.

Specific Comments

p. 13:24-34—We found this passage both important for foregrounding types of uncertainty, but a bit confusing about what they are. We detect a distinction without a difference between “natural variability” uncertainty and the second uncertainty “in how climate systems will respond to GHG [greenhouse gas] increases...” as the dominant source of uncertainty identified in this passage. Aren't ocean circulation patterns like El Nino and the Pacific Decadal Oscillation (identified as reflecting the first type of

⁹ Conversely, if sedimentation rates outpace sea level rise, then shore habitats can encroach on open water, resulting in a shallowing of channels and, over time, a loss of flow capacity. But this latter condition is not the problem we face at present in the Delta.

uncertainty) part of climate systems (identified as reflecting the second type)? They interact with atmospheric circulation to generate weather, and over time, climate. It strikes us that this is really the same uncertainty, and therefore the passage really only identifies two types of uncertainty—climate system response to GHG increases and modeling scenario uncertainty. But we would appreciate it if the DSC staff would confront this directly, even if it's to make clear what the difference really is in this passage between the first two types of uncertainty. Our point is that from this discussion, "natural variability" lacks foundation relative to the climate response uncertainty; not that it is not there.

We also are concerned about assumptions tending toward central tendencies in model results that may not be borne out given the observed modeling tendency to emphasize changes to the weather extremes—which would be quite distinct from "central tendencies." How is aggregating multiple model results generate realistic appraisals of future extremes? or can it? Are central tendencies resolvable with recent UCLA research indicating a "whiplash" of climate extremes modeled for California's future?¹⁰

p. 15:1-11—It is unclear to us, given the statement "When projections were less certain even in the direction of change, they were omitted from the earlier sections" what is being referred to in "earlier sections." This is highly unspecific and needs clarification, a little like being charged with a crime without being able to confront your accuser.

p. 15:12-18—We did find this paragraph pretty clear in explaining that there is more certainty in the projected trends of air and water temperatures, sea level rise, snowpack decline, and other physical parameters due to rising GHG concentrations, but that the sensitivity of those interactions with climate systems—the interactions of oceans with atmosphere that generate circulation and weather—that have greater uncertainty. This was the clearest passage in the entire uncertainty discussion to this point.

p. 15:19-39—This passage moves the discussion of uncertainty to adaptive management as a "means of addressing uncertainty associated with climate change." We find this passage problematic, however, not least because it lacks a starting point that is clear from the scientific literature about the Delta and application of adaptive management. That starting point should be the National Research Council's 2011 report, *A Review of the Use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan*. While this report is specific to the Bay Delta Conservation Plan's efforts to employ adaptive management practices and principles, it has the unique virtue of applying these factors to the Bay-Delta estuary. If anything, DSC staff need to step back from the five principles identified in this passage (15:27-34) and connect them to the best available literature on adaptive management, the existing

¹⁰ See Daniel Swain's blog, "[Increasing precipitation whiplash in twenty-first century California](#)," *California Weather Blog*, April 22, 2018; and Swain, et al 2018, "Increasing precipitation volatility in twenty-first-century California," *Nature Climate Change*, accessible on April 23, 2018 at <https://www.nature.com/articles/s41558-018-0140-y>.

science programs now at work on Delta and Suisun Marsh research, the bewildering array of agencies that operate in the Delta, and to what extent the scope of adaptive management should reach.

Adaptive management construed as a hall pass for increased exports or Delta levee disinvestment is no substitute for adhering to the water policy framework we outlined in Attachment 2 to this letter. This is because a lack of full information is not a reason not to act in a protective fashion with regard to Delta public trust resources, the Delta economy, and the Delta as a set of valued, unique legacy communities. The DSC should evaluate applying the precautionary principle in developing its Chapter 4 amendment.

p. 13:6-10 and 18:16-21—We were struck that while sea level rise could be as high as 4.6 feet at the Golden Gate by 2065 on page 13, the amount of sea level rise simultaneous in the Central Delta may only be 2.9 feet, a difference of 1.7 feet or so (and presumably lower still in the eastern Delta). This is about a 37 percent attenuation from the Golden Gate. This suggests to a reader at page 13 that the amount of adjustment to levee elevations would be less, and therefore perhaps easier to address in the next 50 or so years as compared with sea level rise impacts closer to the Golden Gate. Yet on page 18, we learn that the DSC's own Delta levee investment strategy report (cited as authors "Ellis et al 2017" rather than as a DSC report) is described as pessimistically warning that "Raising levees or repairing them in response to overtopping and breaching will likely not be feasible at all location...prompting planned or unplanned tidal or fluvial connectivity."

First, we respectfully request that this report be identified in the paper's references as having corporate authorship by the Delta Stewardship Council, and prepared by Ellis et al.

Second, we have long perceived the Delta Stewardship Council as at best ambivalent about investing in the long-term and continuous protection of Delta levees, and this is an instance where that ambivalence is evident—despite the likelihood that SLR in the central Delta by 2065 is expected to be at 2.9 feet not 4.6 feet. But we find the implication that planned or unplanned tidal or fluvial connectivity resulting from levee failures to be a form of Council *schadenfreude* (guilty pleasure) at worst, and a kind of effort at self-fulfilling prophecy at best. DSC staff language here (and by implication in the DSC's Delta levee investment strategy report) seeks to lower expectations about the long-term sustainability of Delta levees. They have already survived—at least some—for over a century, and as we pointed out earlier in this comment letter island owners and Delta engineers and first responders have done stalwart work at seasonal flood control preparation as well as putting DWR Delta levee subvention funds to use maintaining and shoring up Delta levees continually.

It is at this point that the Delta Economic Sustainability Plan's discussion of Delta levees and their centrality to the Delta's future is most relevant to the climate change paper—

and its absence speaks volumes about the woefully inadequate treatment of Delta levee adaptation to climate change and the DSC's commitment to relying on best available science for this amendment process. A serious consideration using best available science here would start with findings from the Delta Risk Management Strategy Report prepared by DWR in 2008 and continue through the Delta Economic Sustainability Plan's levee discussion prepared for the Delta Protection Commission. This is another example of a DSC synthesis paper failing to employ best available science and analysis to illuminate the Delta's options as the DSC prepares to amend Delta Plan, Chapter 4. Just because these documents were published prior to the 2013 adoption date of the Delta Plan does not render them obsolete; instead they should be seen as baselines of comprehensive analysis from which DSC evaluation of sea level rise impacts in the Delta should be evaluated.

p. 23:21-40, and 24:Figure 8—We have great difficulty understanding the value of a map that assumes that existing Delta levees are absent in order to show habitat types based on elevation in the Delta Region (Figure 8). Again, is this some sort of DSC schadenfreude exercise to indicate how much habitat could be gained from destroying the Delta's agricultural, tourism and recreational economies, as well as their supporting legacy communities—all contrary to the Delta Reform Act's clear policy statements about the value of these human resources in the Delta as well? As a planning exercise it fails utterly to take seriously the long-term sustainability of these human activities and the strongly implied obligation by the DSC to look for opportunities to create restored habitat, not to contemplate Delta economic destruction for the sake of maximizing habitat. We see too that Figure 8 is also Figure 4-6 in Delta Plan, Chapter 4—which similarly lacks a caption. We do not doubt the importance of land elevation to establishing and sustaining new or ongoing habitat for challenged ecosystems. But the restoration opportunities are to be found by sifting amid the constraints given by the existing and sustained Delta, not in fantasies of wholesale Delta levee disappearance.

This map appears to have its origins with a California Department of Fish and Game (now Wildlife) 2011 document, *Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta Ecological Management Zone and the Sacramento and San Joaquin Valley Regions*. We recommend that DSC staff revisit what this document actually intended with this map. We could not locate this document ourselves to review, so we respectfully request that its URL be made available in References in a future draft of this paper. The map is ineffective at moving DSC Delta Plan Chapter 4 restoration planning forward and only encourages improper fantasies of Delta levee destruction that are not part of Delta Reform Act mandates, goals, and objectives.

p. 28:8-9—The unpublished analysis of channel scour data by Williams (2016) is neither referenced at the back of this paper, nor does it appear, being unpublished, to have been peer-reviewed. In the latter instance, it appears to us to be inappropriate where the DSC is to rely on best available science. We recommend the sentence using this reference be deleted.

Protection, Restoration, and Enhancement of the Delta Ecosystem Paper

General Comments

We read this paper last, and found it the most accessible, synthetic, and fair-minded of the three synthesis papers. In particular, we were gratified to see attempts at unifying discussions about the societal benefits of ecosystem restoration and acknowledgement that island levees have a place in the Delta's future (e.g., 5:1-12, 5:17-20).

We continue to see a lack of needed balancing in this paper, however. Benefits must be balanced with costs and vice-versa. In particular, we note that unexamined assertion that "decreasing exports have economic costs for the state." Yet that is what the Delta Reform act mandates for reasons having everything to do with the ecological costs that excessive exports imposed on Delta ecosystems and communities to date. Delta ecosystem services to society are benefits that to date have been largely ignored, and not just by the DSC.

Moreover, the DSC staff unleash a "straw man" that no serious Delta advocate has ever sought—the claim (9:26-28) that "ending exporting would cost approximately \$1.5 billion a year while even a 50 percent reduction would cost \$400 million a year in the cost of water scarcity." We repeat: no serious Delta advocate has advocated that state and federal water project exports from the Delta should end. Delta advocates have always been willing to share Delta water since the Delta Protection Act of 1959. That Act acknowledges, first, that "water surplus to the needs of the areas in which it originates is gathered in the Delta and thereby provides a common source of fresh water supply for water deficient areas." (Water Code section 12200.) This Act also states that these exports are both necessary to the peace, health, safety and welfare of the people of the State, except that "their delivery is subject to the area of origin statutes in the Water Code (Water Code section 12201) and that the Delta requires salinity control and an adequate water supply for users of water in the Delta, who are also included as among the areas of origin in state law (Water Code section 12202). "No water shall be exported which is necessary to meet the requirements" of the Act (Water Code section 12204). Best available science does not extend to the employment of straw men, especially when a straw man scenario would be contrary to law.

If DSC staff report economic costs of decreased exports they should also responsibly and systematically estimate potential economic benefits. These could include improved fishery populations and commercial and sport fishing catch performance, increased tourism into and through the Delta, the economic benefit of improved Delta water quality for both exports and in-Delta supplies, improved agricultural output, and other potential benefits of reduced exports.

Specific Comments

p. 17: Table 3-1 — This chart/table is titled "Evaluation of Ecosystem Services Provided by a Range of Agricultural Practices." This chart/table is obtained and reproduced from a study by Shackelford et al (2017) of California agriculture and its opportunities for approaches to reconciliation ecology. The DSC staff summary of this study and its chart misses the essential importance of the Shackelford study, which lies in its identification of a scientific research agenda to which DSC's science program and the Delta Independent Science Board (DISB) could readily and directly contribute given such priorities.

We see the potential research agenda this way: By our tally of the chart's results, 20 different agricultural practices contribute to benefiting or are likely to benefit ecosystem services such as crop production, soil regulation and pollination (six are indicated to be unqualifiedly beneficial to ecosystem services). Fourteen (14) more may involve trade-offs between benefits and potential harms to ecosystem services; understanding of such "trade-offs" could be improved and clarified through additional research. There are 46 agricultural practices with "unknown effectiveness" in relation to ecosystem services and another 50 practices for which there is "no evidence" of either benefits or harms to ecosystem services.

To us, then, there are thus at least 117 additional areas of research for a DSC adaptive management program that should address the linkages and potential effectiveness of agricultural practices in enhancing or sustaining ecosystem services, many of which could be applicable in the Delta. We recommend the DSC direct the Delta Science Program and the DISB to examine how they will contribute to closing such gaps in research in this area.

p. 39:9-19 — Consideration 2 recognizes the need to incorporate human factors "in achieving the coequal goals" but reflects the blind spot of the DSC for the larger water policy framework we identified earlier in this comment letter. The benefits of restoration to society must be placed within this framework, which, as this Consideration 2 acknowledges, includes environmental justice. DSC needs to commit to a policy statement derived from established California policies in state law and elsewhere concerning anti-discrimination and environmental justice standards and requirements— including the human right to water. Restore the Delta summarized these standards and requirements in our April 17, 2017 letter to the DSC on the conveyance, storage, and operations amendments.¹¹

¹¹ Accessible at <http://www.restorethedelta.org/wp-content/uploads/20170417-RTD-EJCW-Letter-DSC-Storage-Conveyance-Operations-1.pdf>, Attachment 1, pages 28-32.